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AUTO LOCKED MECHANISM

TECHNICAL FIELD

This invention relates to an auto locked mechanism.

In particular the present invention is intended for use with securing adjustable length poles, and extendable mechanisms, and also to alternative methods of securing elements together.

BACKGROUND ART

In many industrial and consumer products there is a need to adjust the length of elements. Examples of such elements are telescoping tubes or pipes usually made of metal, but sometimes of other materials.

An example is ladders, scaffolding and props in the building industry, and bicycle seat posts, furniture, walking canes, tent poles, and ski poles in consumer products.

Any situation where there are telescoping elements, it can be an advantage to be able to more reliably secure the elements in a variety of positions relative to each other.

Present mechanisms act to secure the elements in a fixed position. An example is the twist lock on a ski pole where a friction bush secures the elements, by being compressed by rotation.

Often a clamp is used to reduce the diameter of the outer of the two telescoping elements. Another securing mechanism uses a grub screw or threaded bolt or threaded T-bar tool to lock up against the inner telescoping element.

In industrial situations it is very important that the fixing is very secure, as failure could lead to injury or death to people in the vicinity.

Securing mechanisms require the operator to have enough strength and knowledge to use the tools provided in the correct way to achieve a safe connection between the elements. For example a grub screw or bolt, if insufficiently tightened, may allow the components to telescope or rotate under load or stress.

Many of the mechanisms that exist now require several components and are unnecessarily heavy or complicated, which of course makes them more expensive to produce.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinence of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description, which is given by way of example only.

DESCRIPTION OF THE INVENTION

According to one aspect of the present invention there is provided a securing apparatus, including

a deformable body, wherein the body is configured to provide an interference fit with at least one article to which it is fitted, and

an aperture within the body, wherein the aperture is configured to accept the releasing tool,

characterised in that

the securing apparatus is unlocked by the operation of the releasing tool with respect to the body and remains locked at all other times.

Throughout the present specification the term "locked" should be understood to mean that a force, significantly greater than that applied during the normal operation of the assembly to which the present invention is attached, will need to be applied to the present invention in order to cause the present invention to release the article to which it is secured.

It should be understood that in applications where safety may be an issue, (an example of which would be to secure pieces of scaffolding or framework etc,) the applied force necessary to cause the securing device to "slip" or to release the assembly, will need to exceed any safety limits or guidelines that may apply to the equipment or installation.

Within some preferred embodiments of the present invention the body will contain at least one ridge (or tooth) in order to improve the grip applied to the article to which the present invention is attached.

It should be understood that in some preferred embodiments of the present invention the article to which the present invention is attached will have a complementary recess into which a ridge or tooth will fit to further improve the strength of adhesion between the article and the present invention.

Throughout the present specification the term "unlocked" should be understood to mean that the present invention is able to be removed from, or moved with respect to, an article to which it has been, or will be, secured.

Within some preferred embodiments of the present invention the releasing tool includes a non-circular section, (such as a cam) which when inserted and rotated will elastically deform at least part of the body to increase the internal cross-section sufficiently, over at least part of the length of the body, to release any article that is being secured by the securing apparatus.

It should be appreciated that throughout the present specification the term "non-circular section" should be understood to mean items such as a cam, or any other shape or configuration which when inserted and/or rotated within an aperture that is constructed as part of the body of the present invention, will cause the present

invention to be deformed from its resting position to a point where the present invention can be moved with respect to the article to which it was, or is intended to be, secured.

Within some preferred embodiments of the present invention the securing apparatus, or at least the body of which, will be permanently fixed to, or constructed as part of, an article other than the article to which it is intended to be secured.

It should be appreciated however that in some other embodiments of the present invention the securing apparatus is temporarily affixed to an article including those that can be adjustable in length.

It should be appreciated that in some other preferred embodiments of the present invention the securing apparatus co-joins a plurality of articles, and in some of these embodiments each article can be released from the present invention individually.

It should be understood that in most preferred embodiments of the present invention at least one side of the aperture is bisected by a slot that is substantially perpendicular to the axis of the aperture, wherein the slot and/or the aperture can be terminated by a stress reduction device such as a substantially circular hole.

The inclusion of the slot allows each section of the aperture, i.e. the section each side of the slot, to be opened and operated individually thereby ensuring that the operation of the releasing tool within one part of the aperture will not release an article to which another part of the aperture is secured.

In some preferred embodiments of the present invention there will be a plurality of apertures, wherein each aperture can be operated via a releasing tool so as to individually release an article.

It should be appreciated that the internal dimensions of the body of the securing device are smaller than the dimensions of the shaft / tube / pipe / rod, etc to which the present invention is to be fitted, as this will greatly improve the locking strength of the present invention onto such an article.

In all preferred embodiments of the present invention the removal of the releasing tool from the aperture will ensure that the securing device is in a locked position by default.

This is due to the inherent mechanical properties of the material(s) from which the body is constructed.

Operation of the releasing tool will cause a level of elastic deformation of the body and hence once the tool is removed the body will try to revert back to its normal "relaxed" state.

The relaxed dimensions of the body are such that it cannot be fitted onto the article that it is intended to secure and needs to be deformed by the releasing tool to a point where its dimensions are altered sufficiently to where it can fit onto the article.

Therefore, once the tool is released the body cannot revert to its former dimensions due to the presence of the article and it will therefore exert a force against the article that is hindering this action.

It is this force that provides the positive pressure between the body and the article and hence the interference fit that secures the two items together.

This action is equally applicable to securing an article to the interior surface of the body or to securing an article to the exterior surface of the body.

An example of securing an article to the interior surface of the body would be where an adjustable length rod is needed, as the rod would need to be able to move through the interior of the body to the desired position before being secured.

An example of securing an article to the exterior surface of the body would be where a streamlined connection of two or more tubes is desired, as the body would not stand proud of the exterior surfaces of the tubes.

It should be appreciated that in some preferred embodiments of the present invention the releasing tool is constructed with a threaded section and is configured so that the securing apparatus is unlocked by the insertion of the releasing tool into a complementary threaded area of the body, or of the aperture, to a point wherein the required widening of an area of the aperture is achieved.

In some preferred embodiments of the present invention the releasing tool is tapered or has a non-uniform cross-section (e.g. a dovetailed or wedged section) configured so that the releasing tool is pushed into the aperture in order to spread the aperture to a point where the previously secured article is now insecure or unlocked, or to the point where the present invention can be fitted over part of an article to which it is intended to be secured.

In preferred embodiments of the present invention the body is configured to include at least one seal wherein the seal is configured to stop any leakage of material from within a secured article.

It should be appreciated that in most embodiments of the present invention the internal shape of the body will be circular.

However, this should not be seen to be a limitation on the present invention in any way as in other embodiments the body can be non-circular, e.g. oval, rectangular, triangular etc.

It should be clearly understood that the present invention is equally suited to securing tubular items as well as solid items and that tubular items may be secured by their internal surface or their external surface.

The items secured could include tubes or solid bars of any cross-section, or made of plate glass, sheet or plate metal, or any other relatively incompressible material, in any cross-section or dimension.

A useful application would be a threaded nut which has a slot allowing an increase in the internal aperture dimension, perhaps by operation of a releasing tool on the nut, thereby allowing a quick release, or application of the nut, with out having to wind along the thread.

Such a nut could also be designed to be self-locking by the nut element compressing against the threaded shaft of the bolt element (whether a bolt or other form). The thread of the nut would therefore be forming a compressive interference fit on the bolt.

According to another aspect of the present invention as provided a method of operating a securing apparatus, including:

a deformable body, wherein the body is configured to provide a secure interference fit with at least one article to which it is fitted, and

an aperture within the body, wherein the aperture is configured to accept a releasing tool,

characterised by the step of

inserting a releasing tool within the aperture until the securing apparatus is unlocked.

According to another aspect of the present invention as provided a method of operating a securing apparatus, including:

a deformable body, wherein the body is configured to provide a secure interference fit with at least one article to which it is fitted, and

an aperture within the body, wherein the aperture is configured to accept a releasing tool,

characterised by the step of

inserting and partially rotating a releasing tool within the aperture until the securing apparatus is unlocked.

According to another aspect of the present invention there is provided a releasing tool for a securing apparatus as previously disclosed,

characterised in that

the releasing tool is configured to operate with respect to the body in order to unlock the securing assembly.

In some preferred embodiments of the present invention the releasing tool is configured as a cam.

In some other preferred embodiments of the present invention the releasing tool is threaded.

In some other preferred embodiments of the present invention the releasing tool has a wedge-like configuration.

It is clear from the aforegoing description that the present invention has many significant advantages over other forms of connector, particularly in areas where safety is concerned such as the construction industry, as a simple glance at the fitted securing apparatus can ascertain whether the releasing tool is present or not, as if the releasing tool is not present the securing apparatus must be in the locked position.

This simple fact ensures that items such as scaffolding joints can be seen to be securely fitted as there is no partial securing of these elements as they will either be locked or unlocked.

This overcomes a serious problem with the present mechanisms that are available as these are generally tightened with an Allen key (or other securing device) in a manner that allows for partial securement to be achieved and which can then cause the subsequent collapse of the structure.

Another significant advantage of the present invention is that it can be constructed to operate to either secure an article by gripping the articles outer surface, or to fit inside and secure an article by gripping its' inner surface.

A combination of these systems can also be used e.g. to secure the inner surface of an article to a stud or rod-like structure.

Due to the simplicity of the design of the present invention it is envisaged that they can also be used in the construction of various mechanical assemblies, including miniature devices or any other size of device where the positive securing of a device to another device or into a preferred position is needed.

This can include items such as window frames, hinges, etc. and can be used to replace nuts or other fastenings in a variety of applications.

Where the hinge is designed to self lock onto the parts it connects to, such as plate glass, the hinge pin could have a cam aperture and slot, both orientated lengthways, allowing the hinge pin to have a dual function of being the element the hinge parts rotate about and also the location for the insertion of a releasing tool (in the cam aperture of the hinge pin)

Another advantage of the present invention is that the operation of the releasing tool can be used to not only remove the securing device from the article but also to adjust the position of the article with respect to the securing device or another article to which the securing device is adjoined.

DESCRIPTION OF VIEWS OF THE INVENTION

FIG. 1: A diagrammatical representation of a trench prop with an auto locked mechanism in various stages of assembly and extension.

FIG. 2: A diagrammatical representation of an auto locked mechanism, which uses a cam tool.

FIG. 3: A diagrammatical representation of a pedestal table base with an auto locked mechanism.

FIG. 4: A diagrammatical representation of an auto locked connector, which is an example of a mechanism that uses a threaded tool.

FIG. 5. An auto locked connector for securing to articles by an internal surface.

FIG. 6. An auto locked nut.

FIG. 7. A toothed auto locked connector.

FIG. 8. An extruded auto locked window frame or picture frame moulding.

FIG. 9. An auto locked connector for securing sheet materials.

FIG. 10. A releasing tool and auto locking slotted tube.

FIG. 11. An auto locked hinge with split hinge pin and associated releasing tool.

FIG. 12. An auto locked tube or pipe T-shaped connector.

FIG. 13. An auto locked tube or pipe straight connector.

FIG. 14. An auto locked tube or pipe telescopic connector.

FIG. 15. A wedge shaped releasing tool, and auto locking slotted tube with dovetailed slot detailing.

BEST MODES FOR CARRYING OUT THE INVENTION

With reference to the figures there as illustrated a securing apparatus.

The securing apparatus (1) consists of a body (2) and an aperture (3.)

Some embodiments also contain a side slot (4), particularly if the aperture (3) does not extend the full length of the body (2), or if the aperture (3) is split into separately operated sections.

Figure 1 shows the securing apparatus (1) fitted to the end of a hollow shaft (5).

The telescoping section (6), which has a smaller cross-sectional area, is then secured by an area of the body (2) with a correspondingly smaller cross-sectional area to the area securing the hollow shaft (5).

It is necessary to adjust the position of the telescoping section (6) with respect to the shaft (5) without affecting the locking of the securing apparatus (1) onto the shaft (5).

Therefore a side slot (4) bisects the aperture (3) so that each section of the securing apparatus (1) can be released separately.

Figure 2 shows a similar embodiment of the securing apparatus to that in Figure 1, however this embodiment has a non-aperture section (7) of the body (2) that can be permanently affixed to items such as the shaft (5).

It should be noted that the non-aperture section (7) can equally be constructed as part of a device or assembly, including a shaft (7) such as in Figure 1.

Figure 2 clearly shows that this embodiment is to be operated with a cam style releasing tool.

Figure 3 shows a pedestal table leg (8) that can have its length adjusted.

The securing apparatus 1 in this application is of an extended body length (2) in order to provide a large surface contact area between the body (2) and the leg (8) to increase the load that is able to be safely supported by the table leg (8).

It should be noted that the stress reduction device (9) can clearly be seen at the end of the aperture (3) in the close up view of figure (3).

Figure 4 shows a typical securing apparatus (1) for securing two articles together.

A threaded releasing tool (13) is inserted into a complementarily threaded section (10) if the body (2) until the aperture (3) is opened sufficiently to allow the securing apparatus (1) to be moved over the parts of the two articles that are to be secured together.

The threaded releasing tool (13) is then removed so that the aperture (3) will try to close to its original position and will therefore secure the two articles together.

Figure 5 shows an alternative to the securing apparatus (1) in figure 4, wherein the securing apparatus (1) is configured to join the two articles together by securing their internal surfaces (11) rather than their external surfaces as in figure 4.

The body (2) includes a section (12) that can rotate around the body (2).

The rotating section (12) includes a threaded section (10).

The body (2) includes a number of apertures (3) at either end of the body (2), all of which extend only partially along the length of the body (2).

The threaded releasing tool (13) is inserted into the threaded section (10) which is positioned so that when fully inserted the releasing tool (13) will press against a section of the body (2) causing at least one aperture (3) and a section of the body (2)

to deform to a point where (for example), a tube (14) can be fitted over one end of the securing apparatus (1).

Once the releasing tool (13) is at least partially removed the body (2) and apertures (3) will try to assume their previous positions and thereby will secure the tube (14) by its inside surface.

Any releasing tool described in this specification may remain attached some part of the mechanism, or item the mechanism is attached to, even when the securing apparatus is locked. In this way the tool is to hand when needed to use.

The rotating section (12) is then moved to a position where the releasing tool (13) can be wound in to deform a corresponding aperture (3) and section of the body (2) at the opposite end of the securing apparatus (1) in order that the process can be repeated to secure the second tube (14) to the securing apparatus (1).

Figure 6 shows an example of a quick release slotted nut, with a thread (18) that will engage a threaded bolt (not shown) located at the aperture (21). This nut could be configured to perform the function of a spring washer.

Figure 7 shows an auto locking fitting with a ribbed internal surface area (20), which would enhance the gripping action. A cam shaped releasing tool would operate in the cam hole (19).

Figure 8 is an example of an extruded profile, which could lock on a plate element (location at (21)). A rubber extrusion could be used in a recess (22) to ensure no damage to fragile sheet materials such as glass.

Figure 10 shows a tool (22), which uses leverage to open an auto locking tube (26). In this way a simple slot in a tube can be used and the tube itself can be the auto

locking mechanism itself. In this case the internal diameter of the tube (26) would be a little smaller than the external diameter of the tube or element it is designed to auto lock onto (not shown).

Figure 11 shows a hinge designed to self lock onto the parts it connects to, such as plate glass, the hinge pin (27) could have a cam aperture (39) and slot (38), both orientated lengthways, allowing the hinge pin to have a dual function of being the element the hinge parts rotate about and also the location for the insertion of a releasing tool (in the cam aperture of the hinge pin (39)) Rotating a cam release tool in the aperture (39) would increase the separation of the two sides of the hinge (30 and 31).

With the releasing tool removed, the cam hinge pin would be circular in external cross section, and cam shaped in internal cross section.

Figures 12, 13, and 14 show respectively T-shaped, straight and telescoping tube or pipefittings. There is a raised boss (45) that increases the surface area for the cam action and a cam hole (42) for the releasing tool to operate within. The cam hole is split by a longitudinal slot, which allows the auto locked mechanism to increase in internal dimension with the action of the releasing tool.

The telescoping tube mechanism in figure 14 secures a larger tube (not shown) at one end (43) and a smaller telescoping tube (not shown) with the other end (44), in the aperture shown (41). The side slot (46) allows one end (44) to open. And the other (43) to remain fixed.

Figure 15 shows a simple tubular auto locking mechanism (36) (although it need not be this cross section), which has a slot (34), which is widened by the action of the releasing tool (32). In use the tool is grasped by a handle portion (35) and forcibly

slid along the slot (34) to increase the internal dimension of the aperture (37). The cross section of the tool (32) may be reduced in the leading end (33) to aid the insertion and use of the releasing tool.

Aspects of the present invention have been discussed by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.